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FIRST LETTER REPORT ON EVALUATION (U)

(15 November 1965 to 15 December 1965)

25X1

16 December 1965

DECLASS REVIEW by NIMA/DOD

GROUP-1

Excluded from automatic downgrading
and declassification.

Author

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First Letter Report on Evaluation (U)

The major efforts during this reporting period were in two areas:

1. Delivery, installation, and checkout of the [] coherent Enlarger System. 25X1

2. Design of preliminary theoretical and experimental evaluation techniques for initial characterization of the imaging properties of the enlarger.

25X1 The [] people, under direction of [] (see visits to contractor in last section), were most cooperative and diligent in delivering, 25X1

installing, and performing the initial system checkout at the [] Physical Optics 25X1

Lab Facilities. As far as could be ascertained by [] the enlarger was 25X1

operating in "as good a condition at [] as it had ever been operated at [] 25X1

25X1 [] Although this is a qualitative statement it does reflect that the [] 25X1

25X1 [] Project Leader [] was satisfied that the instrument had not suffered any deleterious effects (mechanical, optical, electrical or electronic) during its 25X1

disassembly and reassembly stages at [] 25X1

25X1 A series of test exposures of an []⁶ 3 bar high contrast resolution target were made during the final checkout by [] These exposures were 25X1

25X1 returned to [] during his visit of 19 November and have been examined by the writer using a 32 power microscope. It should be noted that the only valid information to be obtained from this series is the relative image quality for 3 bar high contrast targets and the change in the imagery at different positions in the 9 x 9 film plane. The discrepancies in imagery for symmetrically located areas from the optical axis or center of the film frame can be due to improper optical alignment of the optics, the film magazine, the liquid gate film holder, and/or

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Resolution vs Location, Object^{*} Plane,
Viewing from Image Plane Towards Object Plane

Location	Approximate Coordinates (x , y)	Cutoff (just resolved) line pairs/mm	Good Imagery (well resolved) line pairs/mm
Top Left	(8 3/8", 1 3/4")	102 $\frac{H}{V}$	57.0 $\frac{H}{V}$
Top Right	(1 3/8", 5/8")	40.3H 102 V	16 H 28.5 V
Bottom Right	(7/8", 8 1/4")	71.8H 90.5V	32 H 32 V
Bottom Left	(8 7/8", 8 1/8")	181 $\frac{H}{V}$	128 $\frac{H}{V}$
Center	(4 1/2", 4 1/2")	203 $\frac{H}{V}$	144 $\frac{H}{V}$

* The image plane resolutions are 1/4 the above values due to the 4X enlargement from object plane. i. e. 102 l/mm is 25.5 l/mm on the image plane film record.

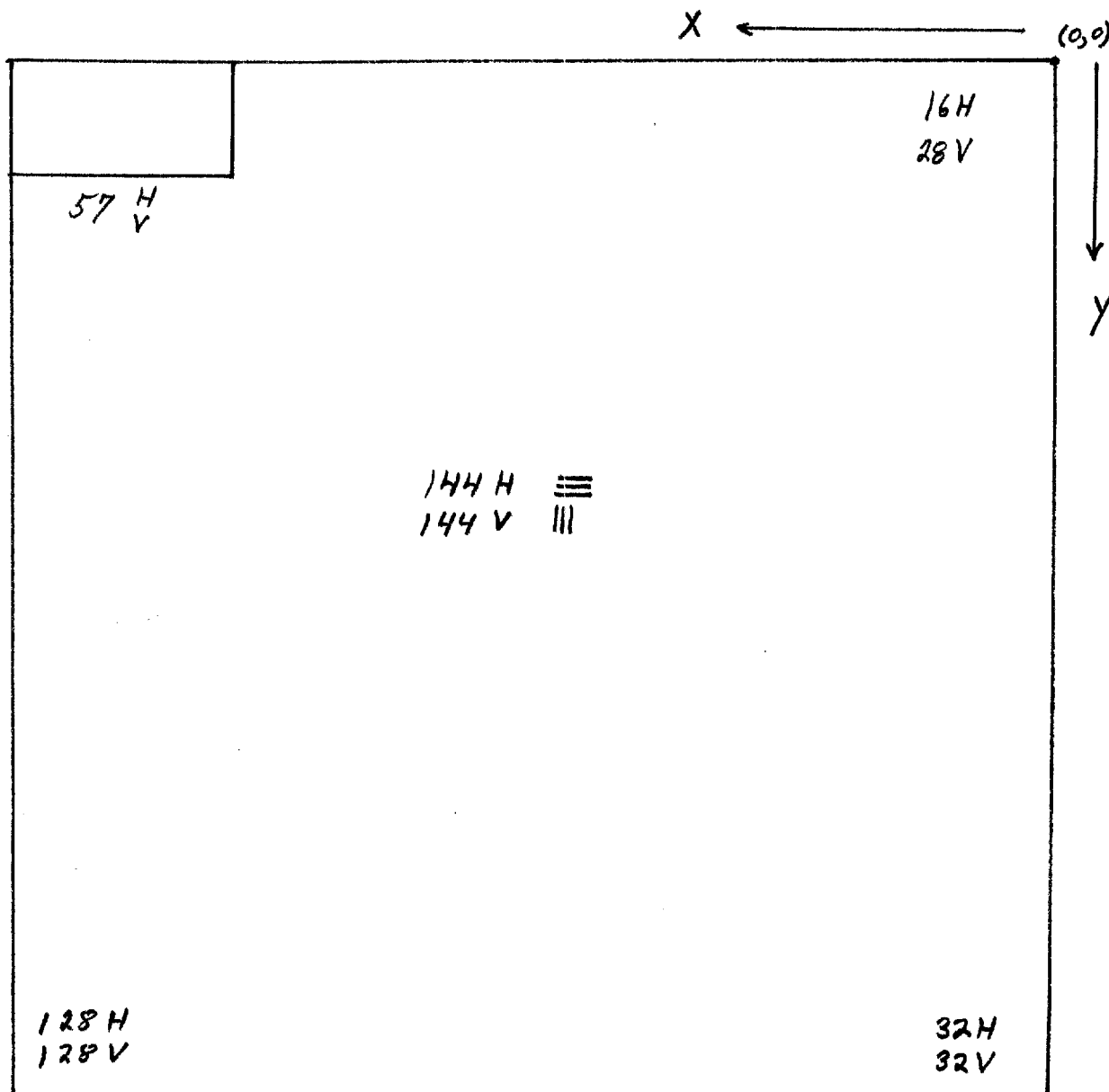
25X1 film was used to record these images.

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Figure 1. Schematic location of "Well Resolved" Bars from 3 bar target data on SO-243 film - 11, 12 December 1965. Line pair resolution figures refer to object space resolution. Image space resolution is 1/4 the stated value due to 4X enlargement ratio.



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decentering of lens elements within either (or both) of the 9" or 36" focal length imaging lenses. The only purpose of showing these values now is to record the performance of the enlarger, for a particular target, at the time of transferral

of it from Whether subsequent tests by personnel can locate the source of these deviations from the original specifications (200ℓ/mm over entire field at 0.83 modulation contrast transfer) and reduce their magnitude remains to be seen.

Further system evaluation by means of photographic image recording through the enlarger has been avoided until a suitable film processing system was installed in a darkroom and until meaningful results from a theoretical study of partially coherent imaging are available to guide us in the design and fabrication of suitable targets. A gas bust agitation system has now been completed using 3 1/2 gal processing tanks to enable us to process 9" aerial film in short lengths (1 or 2 frames). Although theoretical studies are not yet far enough along to indicate conclusively the best method of determining the degree of coherence in the object plane of the enlarger two approaches are under investigation. The first, the use of a two aperture variable spacing interferometer is under design, and the second approach involves measurement of edge trace data to obtain both the coherence interval and the systems apparent transfer response.

WORK FOR NEXT PERIOD

Completion of design and fabrication of the variable spacing interferometer should be accomplished during this period. The theoretical analysis of the use of edge targets as test objects should be completed and their applicability to the evaluation will be assessed. If this indicates the edge as a suitable test target then a

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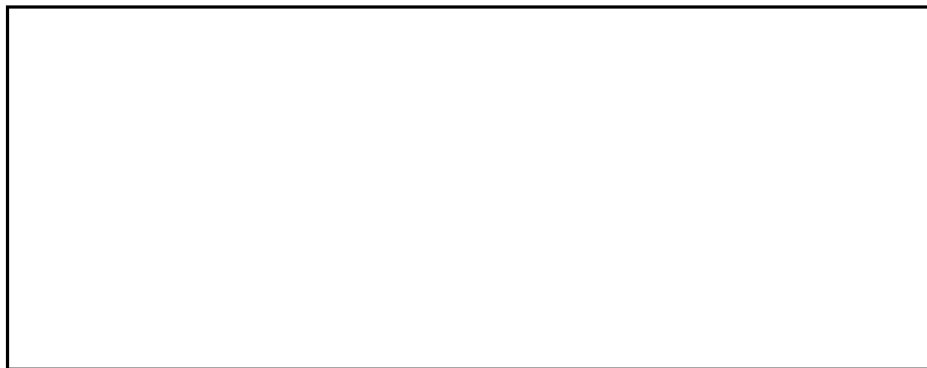
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master reference edge will be fabricated and used. Other test targets, such as Ronchi rulings and sine wave targets will be evaluated and their applicability as test objects determined. A master target may be fabricated to aid in the alignment of the 9 x 9 film back and optical system to try and improve the non-symmetrical image resolution fall-off presently obtained in the enlarger system.

VISITS TO CONTRACTOR

During the weeks of 8-18 November 1965 the following []
personnel were at [] for the assembly and checkout of
the coherent Enlarger.

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On 9 and 10 November 1965, Mr. George M., the sponsor's technical contract
monitor, was at [] He examined the enlarger during its
assembly phase and discussed the [] program with [] and

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